Remarks

Claims 11-25, 27, 37-38, and 40-50 are pending in the application. Claims 28 and 39 have been canceled. Claims 37 and 44-50 have been amended. A terminal disclaimer is attached. No new matter has been added by virtue of this amendment. Reconsideration of the application as amended is requested.

Claim Rejections--35 U.S.C. § 102(b)

The Examiner rejects claims 37-41 under 35 U.S.C. § 102(b), as being anticipated by Uzawa.

Applicant would respectfully ask the Examiner to consider that Uzawa provides x-ray radiation from a synchrotron source. There is no teaching or suggestion in Uzawa of "providing x-ray radiation from **a point source**," as provided in step (c) of claim 37, as amended. Also, **Uzawa does not teach or suggest "collimating or concentrating** said x-ray radiation," as provided in step (d) of claim 37, as amended.

Uzawa provides an alignment apparatus for aligning a mask to a Synchrotron Orbital Radiation (SOR) X-ray exposure apparatus. As Uzawa points out, until SOR there has not been a small size and high power x-ray source, and this fact made it "difficult to install a semiconductor chip manufacturing X-ray exposure apparatus using X-ray lithography in the semiconductor manufacturing plant" (column 1, lines 29-32). Uzawa further notes that a SOR source provides high-power X-rays, making this source of X-rays suitable for semiconductor manufacturing. Thus, Uzawa teaches against the use of the previously available point source x-ray sources that inherently have lower power in favor of the sychrotron orbital source of the radiation that has sufficient power to provide the throughput required in a semiconductor chip manufacturing plant.

As for collimating or concentrating, first, X-ray radiation from SOR is already collimated in one dimension as it emerges from the SOR source, so no collimating step is needed, particularly where the collimated line of X-rays is scanned across the wafer to provide the benefit of collimation in both dimensions. Second, the high power available from the SOR source makes concentrating unnecessary. Thus, there is no motivation for teaching, suggesting, or providing collimating or concentrating in Uzawa. In view of the collimation inherent in the SOR beam and the high power SOR provides, collimating or concentrating would add cost with no benefit. Thus, the rejection of claim 37 and claims dependent thereon under 35 U.S.C. § 102(b), as being anticipated by Uzawa, has been traversed.

The Examiner rejects claims 28 and 50. Independent claim 28 has been canceled. Claim 50 has been amended to depend on claim 37. Thus, the rejection of claim 50 under

35 U.S.C. § 102(b) has been traversed.

Claim 37 has been amended to bring the phrase "or concentrating" from dependent claim 39, now canceled, into claim 37. Collimating or concentrating was also in original claim 1 of the parent case on lines 29-30.

Claim Rejections–Non-Statutory Double Patenting

The Examiner rejects claims 11-25, and 44-49 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-10 of U.S. Patent 6,295,332. The Examiner also rejects claim 27 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 5 of U.S. Patent 6,295,332. Attached is a terminal disclaimer in compliance with 37 CFR 1.321(c) signed by applicant's attorney of record. The terminal disclaimer fully complies with the terms of 37 CFR 3.73(b). Thus, the rejection of claims 11-25, 27, and 44-49 under the judicially created doctrine of obviousness-type double patenting has been traversed.

It is believed that the claims are in condition for allowance. Therefore, applicant respectfully requests favorable reconsideration. If there are any questions please call applicant's attorney at 802 864-1575.

Respectfully submitted,
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Version with markings to show changes made

Please amend the following claims:

Please cancel claim 28 and 39.

Please amend the following claims:

37. (Amended) A method of exposing a resist on a substrate comprising the steps of:

a) providing the substrate with a film of resist;

b) placing the substrate on a stage;

c) providing x-ray radiation from a point source;

d) collimating or concentrating said x-ray radiation;

e) providing a mask for defining exposure of said resist;

f) illuminating said mask with said x-ray radiation after said collimating or concentrating step (d); and

g) exposing said resist with x-ray radiation passing through said mask.

44. (Amended) The method as recited in claim [44] 43, wherein said displacement sensor comprises a differential variable reluctance transducer (DVRT).

45. (Amended) The method as recited in claim [44] 43, further comprising the step of using output of said displacement sensor to control said exposing step.

46. (Amended) The method as recited in claim [46] 45, wherein said mask is positioned with respect to said substrate, said method further comprising the step of exposing said resist at a time when said displacement sensor output indicates that position of said mask with respect to said substrate is optimum.

47. (Amended) The method as recited in claim [46] 45, wherein said mask is spaced from said substrate by a gap, said method further comprising the step of exposing said resist at a time when said displacement sensor output indicates that said gap is optimum.

48. (Amended) The method as recited in claim [46] 43, further comprising the step of using [said] displacement sensor output to control mask to wafer misalignment.

49. (Amended) The method as recited in claim [46] 43, further comprising the step of using [said] displacement sensor output to control substrate x, y, z, rotation, and magnification.

50. (Amended) The [system] method as recited in claim [28]37, wherein said [helium is] x-ray radiation passes through a beam transport chamber having helium or other low attenuation gas at atmospheric pressure or at lower pressure.